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Materiel Test Procedure 8-4-012
U. S. Army Arctic Test Center

U. S. ARMY TEST AND EVALUATION COMMAND
ENVIRONMENTAL TEST PROCEDURE

ARCTIC ENVIRONMENTAL TEST OF CHEMICAL AGENT DETECTOR KITS

1. OBJECTIVE

The objective of the procedures outlined in this MTP is to provide a means of evaluating the performance, safety and human factors engineering characteristics of chemical agent detector kits under arctic winter conditions.

2. BACKGROUND

A chemical agent is defined as a compound, which, in suitably dispersed form produces toxic (damaging or lethal) effects on man, animals, plants or materials. With the increasing possibility that chemical agents may be used as weapons in war, the need for devices to accurately detect and identify chemical agents is also increased since defensive measures must be taken for the protection of personnel, supplies, facilities and equipment.

A variety of kits for the detection of chemical agent contamination of food, water and air have been introduced. Most detection kits are the "go/no-go" type. However, some kits may be used to quantitatively determine chemical agents in water while others are multipurpose kits. Refill kits also exist which may be used in conjunction with other kits for the detection of V agents.

A goal in the development of chemical agent detector kits has been to develop one combination kit that would give a rapid indication of toxic agents in air, water or on surfaces. One recent advance includes the "plaquet" concept as incorporated in a multipurpose kit. This consists essentially of several plastic "holders" containing reagent impregnated disks. When a toxic agent is present, the disk specifically treated to detect that agent indicates a significant color which signals the presence of the agent.

3. REQUIRED EQUIPMENT

- a. Appropriate Arctic winter uniforms and individual field gear.
- b. Vehicles (cargo wheeled and tracked).
- c. Photographic equipment (black and white or color).
- d. All general and special tools and ancillary items required for repairs or maintenance of the test item.
- e. Meteorological instrumentation.
- f. Sequential samplers (M37 or equivalent).
- g. Test equipment as required.
- h. CBR Protective clothing.
- i. Chemical and detector kits and detector paper.

4. REFERENCES

A. AR 70-38, Research, Development, Test and Evaluation of Materiel

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for Extreme Climatic Conditions.

- B. USATECOM Regulation 350-6, Training in New or Modified Equipment and Training Devices.
- C. Field Handling and Use of Biological and Chemical Samplers and Equipment at Dugway Proving Ground, Test Division, Test Operations Directorate, Dugway Proving Ground, 15 May 1966.
- D. MTP 8-2-503, Rough Handling and Surface Transport.
- E. MTP 8-2-070, Chemical Agent Detector Kits.
- F. MTP 10-4-500, Arctic Environmental Test, Preoperational Inspection, Physical Characteristics, Human Factors, Safety, and Maintenance Evaluation.

5. SCOPE

5.1 SUMMARY

The procedures outlined in this MTP provide general guidance for testing and evaluating chemical agent detector kits under arctic winter environmental conditions. Specific procedures and testing requirements are determined by the discrete characteristics and performance criteria of the test item.

Tests are performed to the maximum extent possible, with equipment in configurations expected in normal operations under typical conditions of climate and terrain found in arctic and subarctic zones.

The specific tests to be performed and their intended objectives are listed below:

a. Preoperational Inspection and Physical Characteristics - This test provides for an inspection of the test item to:

- 1) Identify damage received during shipping and handling.
- 2) Determine its physical conditions.
- 3) Determine if the test item dimensions, weight and characteristics conform to applicable criteria.
- 4) Locate any defects.

b. Human Factors Engineering and Safety - The objective of this subtest is to determine the effectiveness of human factors, and safety aspects of the test item when operated in an arctic winter environment.

c. Rough Handling and Surface Transport - The objective of this subtest is to determine if the test item will withstand rough handling and surface transport under arctic winter environmental conditions.

d. Field Detection and Operational Characteristics - The objective of this subtest is to determine if the test items will detect the prescribed agents, as stipulated by governing criteria, under arctic winter environmental conditions.

e. Maintenance Evaluation - The objective of this subtest is to determine the maintenance requirements for the test items by their use in an arctic environment, and to determine whether these test items maintenance requirements meet maintenance and maintainability standards as defined by QMR's,

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TC's, SDR's or other established criteria. In addition, a reliability study shall be made to determine the reliability of the test items and derive information regarding expected service life and required logistical support under arctic environmental conditions.

5.2 LIMITATIONS

This MTP is limited to general procedures for environmental testing of chemical agent detector kits.

Those procedures that duplicate testing that has been conducted at other facilities and are not peculiar to an arctic winter environment will not normally be conducted.

6. PROCEDURES

6.1 PREPARATION FOR TEST

a. Since arctic winter environmental tests are normally scheduled from October through March (6 months), ensure that the test and comparison items are delivered to the Arctic Test Center prior to 1 October.

b. TDY personnel shall be used to augment assigned personnel and shall be trained to the degree that they are as proficient on the individual test and comparison items as the troops who will use these items.

c. Ensure that all test personnel are familiar with the required physical, technical and operational characteristics of the item under test, such as stipulated in Qualitative Material Requirement (QMR), Small Development Requirement (SDR) and Technical Characteristics (TC), and record this criteria in the test plan.

d. Review all instructional material issued with the test item by the manufacturer, contractor, or government, as well as reports of previous tests conducted on the same type of test item, and familiarize all test personnel with available references.

e. Record the grade, MOS, background, and training of all test personnel and ensure that all personnel receive new equipment training (NET), as referenced in 4 B.

f. Record the following information:

- 1) Nomenclature, serial number(s), and manufacturer's name of the test items.
- 2) Nomenclature, serial number(s), accuracy tolerances, calibrated of the test equipment selected for the tests.
- 3) Date test items were packed.

g. Select test equipment ideally having an accuracy 10 times greater than that of the specified tolerance of the function to be measured.

h. Prepare record forms for systematic entry of data, chronology of tests, and analysis in final evaluation.

i. Prepare adequate safety precautions to provide safety for personnel and equipment, and ensure that all safety SOP's are observed throughout the test. Ensure that a Safety Release has been obtained prior to test conduct.

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j. Outfit all test personnel in appropriate arctic winter clothing as described in MTP 10-4-500, and with individual field equipment, during all equipment testing.

k. Ensure that when not in use, all test and comparison items are stored and maintained in an unsheltered area and exposed to ambient air temperature and prevailing weather conditions.

l. Record the prevailing meteorological conditions during the storage phase, as well as test conduct, to include:

- 1) Temperature
- 2) Humidity, relative or absolute
- 3) Temperature gradient
- 4) Atmospheric pressure
- 5) Precipitation
- 6) Solar radiation
- 7) Wind speed and direction
- 8) Frequency of readings
- 9) Source of data

6.2 TEST CONDUCT

NOTE: These subtests shall be conducted at the coldest applicable temperature, in accordance with specifications of the test item.

6.2.1 Preoperational Inspection and Physical Characteristics

a. Upon receipt, carefully inspect all test items and their shipping and/or packaging containers for completeness, damage and general conditions in accordance with applicable sections of MTP 10-4-500.

b. Identify each test item with an appropriate sequential code number.

6.2.2 Rough Handling and Surface Transport

a. Conduct this subtest in accordance with the applicable sections of MTP 8-2-503.

b. Test personnel carrying the test item (as appropriate) shall perform a cross-country march of 5,000 meters along trails, through densely wooded areas, on hills and across flat open terrain.

c. Pack the test items in vehicles and perform the following:

- 1) A vehicular march of 50 kilometers over primary and secondary roads in wheeled vehicles.
- 2) A vehicular march of 50 kilometers cross-country and over trails in tracked vehicles

d. Thoroughly inspect each test item for loose, damaged or missing parts, and record the following:

- 1) Damage attributed to transporting.

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- 2) Damage attributed to environmental effects.
- 3) Problems encountered while transporting loads.
- 4) Description of test course.
- 5) Description of mode of carry.
- 6) Ambient air temperature, wind velocity and direction, amount and type of precipitation (rain, snow, sleet).

6.2.3 Field Detection and Operational Characteristics

Conduct this subtest in accordance with the applicable sections of MTP 8-2-070.

6.2.3.1 Air Tests

- a. Inspect each test and comparison item for loose, damaged or missing parts and place in the best possible condition.
- b. Using a chemical bomblet or other suitable means, disseminate the agent within the test area.
- c. Order test soldiers (with two test kits each) to move into the area as soon as possible and proceed to identify the agent.

NOTE: Test personnel shall not be informed (if practical) as to the type of agent being used. The test personnel shall also work independently within the area and shall not compare the results.

- d. The results of the two samplers of each test soldier shall be compared with the results of a third sampler.

NOTE: Photographs shall be taken as required, to record typical color reactions of the test item where applicable.

- e. Record all false responses and possible or probable causes.

NOTE: Wherever possible, air samples will be collected for subsequent laboratory analysis to provide data on the amount of agent actually present in the air during the test. Results of laboratory analysis of agent samples collected from the air will be recorded for each trial.

6.2.3.2 Surface Tests

- a. Perform tests as necessary to detect agent on the surface of the ground or snow within the agent dissemination area.
- b. Repeat step a. above using sample plates of glass and metal previously exposed within the agent dissemination area.
- c. Record the following data:

- 1) Agent identify and means of dissemination.
- 2) Test item response.
- 3) Test item response time.

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- 4) Control item response.
- 5) Control item response time.
- 6) Ambient air temperature.
- 7) Temperature gradient.
- 8) Wind velocity and direction.
- 9) Amount and type of precipitation.
- 10) Color photographs as required.
- 11) Analysis of air samples as required.

6.2.4 Human Factors Engineering and Safety

- a. Conduct all Human Factors Engineering and Safety Tests in accordance with the applicable sections of MTP 10-4-500.
- b. Conduct these tests concurrently with the operational tests and include the following:

- 1) Determine if the test items are compatible with personnel outfitting in chemical-biological (CB) protective clothing and equipment (if appropriate).

6.2.5 Maintenance Evaluation

- a. Conduct all maintenance evaluation tests (maintenance and reliability) in accordance with the applicable sections of MTP 10-4-500.
- b. Conduct these tests concurrently with the operational tests as described in this MTP.

6.3 TEST DATA

All test data to be recorded shall be as specified in the individual subtests of this MTP.

6.4 DATA REDUCTION AND PRESENTATION

Processing of raw test data shall, in general, consist of organizing, marking for identification and correlation, and grouping the test data according to test title.

Specific instructions for the reduction and presentation of individual test data are outlined in the succeeding paragraphs.

6.4.1 Preoperational Inspection and Physical Characteristics

Preoperational inspection and physical characteristics data shall be reduced and presented in accordance with MTP 10-4-500.

6.4.2 Rough Handling and Surface Transport

Rough Handling and Surface Transport data shall be reviewed and compared with data obtained from previously accepted items of like nature and specifications. The damage to the test items attributed to the environmental effects

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of handling shall be compared with applicable specifications contained in the appropriate QMR, SDR and TC.

6.4.3 Field Detection and Operational Characteristic

The operation of the items under test in extreme arctic winter conditions shall be determined by comparison with previously accepted items of like nature and specifications. The damage to the test items attributed to arctic environmental effects shall be compared to applicable specifications contained in QMR, SDR and TC.

6.4.4 Human Factors Engineering and Safety

Human Factors and Safety data shall be reduced and presented in accordance with MTP 10-4-500.

6.4.5 Maintenance Evaluation

Maintenance data shall be reduced and presented in accordance with MTP 10-4-500.

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11. SUPPLEMENTARY NOTES

12. SPONSORING MILITARY ACTIVITY

Headquarters

US Army Test and Evaluation Command
Aberdeen Proving Ground, Maryland 21005

13. ABSTRACT

This Environmental Test Procedure describes test methods and techniques for evaluating the technical performance and characteristics of Chemical Agent Detector Kits under Arctic winter conditions. Evaluation is related to the criteria established in Qualitative Materiel Requirements (QMR), Small Development Requirements (SDR), Technical Characteristics (TC), or other applicable design requirements and specifications.

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